Burner with diffuser resistant to high operating temperatures

The present invention relates to a burner, in particular to a premixed burner with a diffuser resistant to high temperatures.

In burners subject to high operating temperatures, such as for example premixed burners, the high thermal stress may easily cause very great mechanical deformations and stress to the burner diffuser, which may lead to the breaking of the diffuser. This drawback occurs with any form of burner diffuser, but has been found to be particularly serious in burners with flat diffusers. To overcome this drawback, it has been proposed to use special materials to make the burner diffuser, for example a metal mesh, or a ceramic material. However, this leads to a significant increase in the cost of the burner if the metal mesh is used and significant fragility of the diffuser if a ceramic material is used.

One object of the present invention is to provide a burner suitable for operating at high operating temperatures that is highly resistant to thermal stress without special materials being required to make the diffuser, which is simple and relatively cheap to build.

According to the invention, a burner is provided that is suppliable with a mixture of air and fuel, comprising a burner body provided with a diffuser in which openings are made for the passage and subsequent combustion of the mixture, characterised in that the diffuser is divided into a plurality of diffuser elements that are adjacent to one another, each element being at least partially free to expand in at least one direction.

The diffuser divided into a plurality of elements adjacent to one another, partially free to expand in at least one direction, has resistance to thermal stress that is significantly greater than is the case with a monobloc diffuser inasmuch as the heat expansions that occurs during burner operation on each diffuser element, induced by said

temperature variations, is noticeably reduced, with a consequent noticeable reduction of deformation and of the mechanical stress induced by it.

According to a preferred embodiment of the present invention, each diffuser element has a shape that is such as to give it great mechanical rigidity.

This enables the flexional stability of each diffuser element to be improved, further increasing resistance to thermal stress.

According to a further aspect of the present invention rigidity-varying means is provided that is suitable for diminishing the rigidity of the diffuser element in a direction parallel to its greater dimension.

This enables mechanical stresses due to heat expansion in the direction of the greater dimension to be further diminished.

The invention will now be disclosed by way of non-limiting examples by reference to the attached drawings in which:

Figure 1 is a perspective view of a burner according to the invention, with a diffuser having the shape of a cylindrical envelope;

Figure 2 is a view of the partially dismantled burner in Figure 1;

Figure 3 is a view of a further burner according to the invention with a double diffuser having the shape of a cylindrical envelope;

Figure 4 is a perspective view of a first embodiment of a diffuser element according to the invention;

Figure 5 is a perspective view of a burner with a diffuser having a substantially flat shape;

Figure 6 is a perspective view of the diffuser elements of the burner in Figure 5;

Figure 7 is an enlarged and fragmentary detail of Figure 6, in which a flow-distributing element is shown that is fitted inside each diffuser element to make uniform the distribution of the flow of mixture to the openings of the diffuser element;

Figure 8 is a perspective view of the distributing element shown in Figure 7;
Figure 9 is a perspective view of a further burner with a diffuser having a substantially flat shape;
Figures 10 and 11 are perspective views of a second embodiment of a diffuser element of the burner according to the invention, integrated with a flow-distributing element;
Figure 12 is a cross section of the diffuser element of Figures 10 and 11;
Figures 13 and 14 are perspective views of a third and of a fourth embodiment of a diffuser element of the burner according to the invention, integrated with a flow-distributing element;
Figure 15 is a perspective view of a fifth embodiment of a diffuser element of the burner according to the invention;
Figure 16 is a cross section of the diffuser element in Figure 15;
Figure 17 is a section like the one in Figure 16, relating moreover to a modification to the diffuser in Figure 15;
Figure 18 is a perspective view of a version of the distributing element shown in Figures 7 and 8;
Figure 19 is a perspective view of a sixth embodiment of a diffuser element of a burner according to the invention;
Figure 20 is a perspective view of a seventh embodiment of a diffuser element according to the invention, integrated with a flow-distributing element;
Figure 21 is an enlarged view of a detail of the diffuser elements of Figures 19 and 20;
Figure 22 is a perspective view of an eighth embodiment of a diffuser element according to the invention;
Figure 22a is a perspective view from below of the diffuser element in Figure 22;
Figure 23 is a cross section of the diffuser element in Figure 4;
Figure 24 is a perspective view of a ninth embodiment of a diffuser element according to the invention;

Figure 25 is a section view of three diffuser elements like the one in Figure 24, brought up to form a diffuser like the burner diffuser in Figure 1;

Figure 26 is a view from above of a tenth embodiment of a diffuser element according to the invention;

Figure 27 is a view from below of the diffuser element in Figure 26;

Figure 28 is a cross section of the diffuser element in Figure 26;

Figure 29 is a perspective view of an eleventh embodiment of a diffuser element for a burner according to the invention;

Figure 30 is a perspective view of two diffuser elements like the one in Figure 29, brought up to form the diffuser of a burner according to the invention;

Figure 31 is a front view of the two diffuser elements in Figure 30;

Figure 32 is a perspective view of a twelfth embodiment of a diffuser element according to the invention;

Figure 33 is a view from above of the diffuser element in Figure 32;

Figure 34 is an enlarged detail of the diffuser element in Figure 32;

Figure 35 is a plan view of a flow-distributing element that is associatable with a diffuser element like the one in Figure 32;

Figure 36 is a side view of the flow-distributing element in Figure 35;

Figure 37 is a perspective view of a thirteenth embodiment of a diffuser element according to the invention;

Figure 38 is a view from above of the diffuser element in Figure 37;

Figure 39 is an enlarged detail of the diffuser element in Figure 37;

Figure 40 is a plan view of a flow-distributing element that is associatable with a diffuser element like the one in Figure 37;

Figure 41 is a side view of the flow-distributing element in Figure 40;
Figure 42 is a perspective view of a fourteenth embodiment of a diffuser element according to the invention;
Figure 43 is an enlarged detail of Figure 42;
Figure 44 is a perspective view of a fifteenth embodiment of a diffuser element according to the invention;
Figure 45 is an enlarged detail of Figure 44;
Figures 46, 47, 48 and 49 are schematic views that show the fitting of a diffuser element according to the invention, for example of the type shown in Figures 22, 22a and 23, to make the diffuser of a burner of the type shown in Figure 1.
Figures 50 and 51 are perspective views of a sixteenth embodiment of a diffuser element according to the invention;
Figure 52 is a perspective view of a burner made with the diffuser elements shown in Figures 50 and 51.
Figure 53 is a fragmentary perspective view of a portion of a burner with a concave cylindrical diffuser made with diffuser elements according to the invention;
Figure 54 is a perspective view of a burner with a convex cylindrical diffuser, made with diffuser elements according to the invention;
Figure 55 is a perspective view of a first version of a diffuser element like the one in Figure 4;
Figure 56 is a longitudinal section of the diffuser element in Figure 55;
Figure 57 is a perspective view of a second version of a diffuser element like the one in Figure 4;
Figure 58 is a longitudinal section of the diffuser element in Figure 57;
Figure 59 is a perspective view of a fitting system of a diffuser element like the one in Figure 4 in a burner like the one shown in Figure 5;
Figure 60 is a longitudinal section of Figure 59.
In Figure 1, 1 shows, overall, a burner according to the invention, comprising a base element 2, with for example the shape of a flange, and a head element 3, with for example

the shape of a bottom, between which a diffuser 4 is arranged and fixed consisting of a plurality of diffuser elements 5, arranged as a cylindrical envelope configuration. Each diffuser element 5 (Figure 4) has a U-shaped cross section, with a first wall 7 of each diffuser element 5 that has a substantially rectangular shape and is turned towards the outside of the burner 1; on the wall 7 openings 6 are made for the passage of the mixture of air and fuel delivered inside the burner 1. The diffuser element 5 furthermore comprises two side walls 8 connected to the two greater opposite sides of the first wall 7 and placed in an approximately radial direction and two front walls 14, only one of which is visible in Figure 4, connected to the lesser sides of the first wall 7 and approximately perpendicular thereto. Inside each diffuser element 5 a flow-distributing element 9 can be arranged, consisting, for example, of a plate 10 (Figure 8), on which holes 11 are distributed for the passage of the mixture of air and fuel. The plate 10 is furthermore provided, on two sides that are opposite each other, with respective bumps 13, which act as spacers to keep the plate 10 at a distance from the wall 7.
The flow-distributing elements 9 can be inserted inside the diffuser elements 5 by resting them against pairs of support rods 12. These support rods 12, in the case of the burner in Figures 1 and 2, are arranged substantially parallel to the walls 8 of the respective diffuser element 5 and protrude by their ends through holes 15 made in the front walls 14. The holes 15 have shapes and dimensions such as to couple with play with the rods 12 in such a way that the latter do not hinder heat expansion of the diffuser element 5. The rods 12 also act as fixing means of the diffuser element 5 to the base element 2 and to the head element 3 of the burner 1.
Alternatively, the diffuser elements 5 can be coupled with the base element 2 and with the head element 3 of the burner 1 by inserting the ends of the diffuser elements into suitable seats made in the base element 2 and in the head element 3, respectively. The dimensions of the seats are

chosen in such a way as to enable coupling with play of the diffuser elements 5, in such a way as not to hinder heat expansion.

Figure 3 shows a version 1a of the burner 1 shown in Figures 1 and 2. This burner 1a is substantially obtained by connecting together a first burner body 17 that is substantially identical to the burner 1 and a second burner body 18 aligned on a straight axis. The first burner body 17 comprises a flange-shaped base element 2 and a head element 19, with a substantially annular shape, between which a first diffuser 4a is arranged and fixed consisting of a plurality of diffuser elements 5, arranged as a cylindrical envelope configuration. The second burner body 18 comprises a base element 19a, with a shape similar to the head element 19 of the first burner body 17 and connected to it, and a head element 3, with a substantially circular shape, between which a second diffuser 4b is arranged and fixed also consisting of a plurality of diffuser elements 5, arranged as a cylindrical envelope configuration.

Figures 5, 6, 7 show a further embodiment of a burner 20 according to the invention, consisting of a substantially rectangular frame 21 with a peripheral flange 22, which is also substantially rectangular, inside which a row of diffuser elements 5 is arranged that are alongside one another to form a diffuser 25 having a substantially flat surface.

In this burner 20 it is advantageous to arrange the support rods 12 transversely in relation to the diffuser elements 5, passing through holes 16 made in the side walls 8 of each diffuser element 5 and further holes made on pairs of opposite sides 24 of the frame 21. In this way the rods 12, by passing through the different adjacent diffuser elements 5, and the pairs of opposite sides 24, also act as connecting elements connecting the diffuser elements 5 together and with the frame 21.

The rods 12 are coupled with play with the holes 16 and with the further holes made on the opposite sides 24 in such a

way as not to hinder heat expansion of the diffuser elements 5.

Alternatively, to couple the diffuser elements 5 with the frame 21, inside the frame 21 seats can be provided that are suitable for receiving and holding in place opposite ends of the diffuser elements 5. Coupling between the diffuser elements 5 and the seats occurs with play in such a way that heat expansion of the diffuser elements 5 is not hindered.

Figure 9 shows a yet further embodiment of a burner 25 according to the invention, similar to the burner 20 shown in Figures 5, 6, 7, from which it differs only inasmuch as inside the substantially rectangular frame 21 a double row of diffuser elements 5 is arranged. The diffuser elements 5 of the two rows are arranged in such a way as to be able to expand in a substantially free manner due to the effect of the temperature variations to which they are subjected during burner operation 25.

Figures 10 to 12 show a second embodiment of a diffuser element 26 of a burner according to the invention. This diffuser element 26 has a box-shaped body, which gives it great flexional rigidity. A first face 28 of the body of the diffuser element 26, intended to be turned towards the outside of the burner, acts as a diffuser and is provided with a plurality of openings 6, 27 for the passage of the mixture of air and fuel delivered into the burner; the openings 6, 27 may have the shape of slits 6 and/or of holes 27. The diffuser element shown in Figures 10, 11 has a row of slits 6, bordered by two double rows of holes 27. A second face 29, opposite the first face 28 and intended to be turned towards the inside of the burner, is provided with a series of openings 31, for example in the shape of holes, distributed along the second face 29. This second face 29 acts as a distributor of the flow of mixture delivered into the burner.

The diffuser element 26 is then integrated with a mixture-flow-distributing element, which enables considerable cost

savings and saving of assembly time of the burner according to the invention.

In the second face 29 a central incision 30 may be made that extends along the entire length of the face, parallel to the greater sides thereof. This incision 30 is used to considerably reduce the value of the mechanical stress occurring on the diffuser element 26 due to the temperature variations to which it is subjected during burner operation. This is because the presence of the incision 30 enables the diffuser element 26 to expand in a substantially free manner in a perpendicular direction to the incision 30.

Figures 13 and 14 show a third embodiment of a diffuser element 26a and a fourth embodiment of a diffuser element 26b according to the invention. The diffuser elements 26a are 26b are similar to the diffuser element 26 from which they differ by the shape of the openings made on the second face 29.

The diffuser element 26a has on the second face 29 rows of openings consisting of slits 32 alternating with holes 33 whilst the diffuser element 26a has on the second face 29 rows of slits 34, staggered between themselves.

Figures 15 and 16 show a fifth embodiment of a diffuser element 26c, similar to the diffuser element 26, from which it differs by the fact that at the ends of the first face 28 it has projections 35, turned towards the inside of the element 26. These projections 35 are used to make coupling of the diffuser elements 26c with the flange 2 and the bottom 3 of the burner quicker and easier.

Figure 17 shows a version 26d of the diffuser element 26c that has projections 35a that are similar to the projections 35 but are turned towards the outside of the diffuser element 26d.

Figure 18 shows a version 9a of the distributing element 9 shown in Figures 7 and 8. The distributing element 9a differs from the distributing element 9 inasmuch as the bumps 13 are replaced by end protrusions 36 of the body 10, which also act as spacers.

Figure 19 shows a sixth embodiment of a diffuser element 37 with a U-shaped cross section with a first face 38 intended to be turned towards the outside of the burner, and a second and third face 39, 40, that are substantially perpendicular to the first face 38 and are intended to be turned towards the inside of the burner. On the face 38 openings 41, 42 are made for the passage of the mixture of air and fuel. The openings 41, 42 may have the shape of slits 41 and of holes 42. The diffuser element 37 shown in Figure 19 is provided on the first face 38 with two rows of slits 41 that are parallel to each other between which a plurality of holes 42 is arranged. At regular intervals along the rows of slits 41 and holes 42 further slits 43 may be made that extend along the entire width of the zone of the face 38 on which the slits 41 and the holes 42 are located. These further slits 43, in addition to acting as openings for the passage of the mixture, enable the face 38 to absorb heat expansion without being subjected to excessive mechanical stress generated by such expansion.

The diffuser element 37 is particularly suitable for making a burner with a substantially flat diffuser, like the ones shown in Figures 5 and 9.

Figure 20 shows a seventh embodiment of a diffuser element 44. This diffuser element 44, integrated with a flow-distributing element, has a similar shape to the diffuser elements shown in Figures 10 to 17 and on its first face 28 has the same opening distribution of the diffuser element 37, including the further slits 43.

Lastly, Figure 21 shows an enlarged view of a version 43a of the further slits 43, which have widenings 45 at the respective ends to reduce the risk of concentrations of mechanical stress due to the heat expansion that occurs during burner operation.

Figures 22, 22a, 23 show an eighth embodiment of a diffuser element 46 according to the invention. The diffuser element 46 has a box structure, with a first convex face 47 intended to be turned towards the outside of the burner and having

the shape of a cylindrical surface sector and a second concave face 48 intended to be turned towards the inside of the burner and also having the shape of a cylindrical surface sector. The two faces 47 and 48 being joined by curved lengths 49, 50.

On said first face 47 openings 51, 52, 53 are made for the passage of the mixture of air and fuel. The openings 51, 52 may have the shape of slits 51 and of holes 52. The diffuser element 46 shown in Figures 22, 22a, 23 is provided on the first face 47 with two rows of slits 51 that are parallel to one another between which a plurality of holes 52 is arranged. At regular intervals, along the rows of slits 51 and holes 52, further slits 53 can be arranged that extend along the entire width of the zone of the first face 47 on which the slits 51 and the holes 52 are located. These further slits 53, in addition to acting as openings for the passage of the mixture, enable the first face 47 to absorb heat expansion without being subjected to excessive mechanical stress generated by the expansion.

On the second face 48 a series of openings 54 is made, for example in the shape of holes, distributed along the second face 48. This second face 48 acts as a distributor of the flow of mixture delivered into the burner.

The diffuser element 46 is then integrated with a mixture-flow-distributing element, which enables significant savings to be made both in terms of manufacturing costs and assembly time of the burner according to the invention.

In the second face 48 a central incision 55 can be made that extends along the entire length of the face, parallel to the greater sides thereof. This incision 55 significantly reduces the value of the mechanical stress that occurs on the diffuser element 46 because of the temperature variations to which it is subjected during burner operation. This is because the presence of the incision 55 enables the diffuser element 46 to expand in a substantially free manner in a direction that is perpendicular to the incision 55.

Near the ends of the first face 47 projections 56 are made that make coupling of the diffuser elements 46 with the flange 2 and the bottom 3 of the burner 1 faster and easier. The projections 56 can be pointed to the outside of the diffuser element 46, or towards the inside thereof.

Figures 24 and 25 show a ninth embodiment of a diffuser element 57 according to the invention similar to the diffuser element 46 shown in Figures 22, 22a, 23.

The diffuser element 57 differs from the diffuser element 46 inasmuch as the walls 58, 59 that connect the first face 47 and the second face 48 are shaped in such a way as to be shapingly coupled with the walls of adjacent diffuser elements 57.

This type of coupling minimises the risk of spillage of mixture between the side walls of adjacent diffuser elements 57, thereby increasing the efficiency of the burner.

Figures 26, 27 and 28 show a tenth embodiment of a diffuser element 60 according to the invention.

The diffuser element 60 has a U-shaped cross section with a first face 61 intended to be turned towards the outside of the burner, and a second and third face 62, 63 that are substantially perpendicular to the first face 61 and are intended to be turned towards the inside of the burner. On the first face 61 openings 51, 52, 53 are made that have a shape and distribution that are similar to the corresponding openings made on the first face 47 of the diffuser elements 46 and 57 disclosed above.

The second and third face 62 and 63 are respectively joined at their free ends with a second distributing element 64 that also has a U-shaped cross section with a first face 65 substantially parallel to the first face 61 of the diffuser element 60 and a second and third face, respectively 66 and 67, substantially parallel to the second face 62 and to the third face 63, respectively of the diffuser element 60.

On the first face 65 of the distributing element 64 openings 68 are made for the passage and the distribution of the flow of the mixture of air and fuel.

In the first face 65 of the distributing element 64 a central incision 69 can be made, extending along the entire length of the face 65, parallel to the greater sides thereof. This incision 69 has functions that are completely similar to those of the incision 55 of the diffuser elements 46 and 57 disclosed previously.

Figures 29, 30, 31 show an eleventh embodiment of a diffuser element 70, having a substantially open box shape, with a top face 71 intended to be turned towards the outside of the burner, two front faces 72, that are substantially perpendicular to the lesser sides of the top face 71 and two side faces 73, 74 that are substantially perpendicular to the greater sides of the top face 71.

The side faces 73, 74 are shaped in such a way as to be shapingly coupled with the corresponding side faces of adjacent diffuser elements 70. This type of coupling minimises the risk of spillage of mixture between the walls of adjacent diffuser elements 70, thus increasing burner efficiency.

On the top face 71 of the diffuser element 70 openings 51, 52, 53 are made that have a shape and distribution similar to the corresponding openings already disclosed with reference to the diffuser elements 46, 57, 60.

Figures 32 to 36 show a twelfth embodiment of a diffuser element 75 according to the invention.

This diffuser element 75 has an open box shape similar to that of the diffuser element 70, with a top face 76 intended to be turned towards the outside of the burner, two front faces 77, 78, that are substantially perpendicular to the lesser sides of the top face 76 and two side faces 79, 80, that are substantially perpendicular to the greater sides of the top face 76.

On the top face 76 openings 81, 82, 83 are made for the evacuation of the mixture of air and fuel.

The openings 81 have the shape of slits arranged in traverse rows staggered between themselves in a central zone of the top face 76; the openings 82 have the shape of holes

arranged in traverse rows staggered between themselves, in two side zones of the top face 76. The openings 83 are traverse slits that extend along the entire width of the top face 76 and continue for a short length, at both their ends on the side walls 79 and 80. The slits 83 have widenings 84 at both their ends.
In addition to acting as openings for the passage of the mixture, the slits 83 also enable the top face 76 to absorb heat expansion without being subjected to excessive mechanical stress generated by the heat expansion. Furthermore, the widenings 84 enable the risk of concentrations of mechanical stress caused by the heat expansion to be reduced, thereby increasing the resistance of the diffuser element 75 to the thermal stress that occurs during burner operation.
Inside each diffuser element 75 a flow-distributing element 85 (Figures 35, 36) can be arranged that for example comprises a plate 86 on which holes 87 are distributed for the passage of the mixture of air and fuel. The plate 86 is provided with end protrusions 88 having a spacer function for maintaining the flow-distributing element 85 distanced from the top face 76 of the diffuser element 75.
Figures 37, 38 and 39 show a thirteenth embodiment of a diffuser element 89 according to the invention.
This diffuser element 89 has a shape that is very similar to that of the diffuser element 75, shown in Figures 32, 33, 34 and differs therefrom only in terms of the shape and distribution of the openings 90, 91 made in the top face 76 for the evacuation of the mixture of air and fuel with which the burner is supplied.
These openings 90, 91 have the shape of slits and are distributed on staggered traverse rows that are located alternately on the entire width of the top face 76 of the diffuser element 89.
The end slits 91 of the rows of slits that are located on the entire width of the top face 76 continue for a short

length on the side faces 79 and 80 and terminate on the faces with a widening 92.
The function of the end slits 91 and of the widening 92 is very similar to the function of the slits 83 with the respective widenings 84, disclosed with reference to the diffuser element 75 shown in Figures 32, 33, 34.
Inside each diffuser element 89 a flow-distributing element 85 (Figures 40 and 41) can be arranged.
Figures 42 and 43 show a fourteenth embodiment of a diffuser element 93 according to the invention.
The diffuser element 93 has a shape that is very similar to that of the diffuser elements 75 and 89 disclosed previously.
On the top face 76 of the diffuser element 93 openings 94, 95, 96 are made for the passage of the mixture of air and fuel. The openings 94 have the shape of slits, distributed on two traverse rows that are parallel to each other, between which a plurality of rows of holes 95 is arranged. At regular intervals along the rows of slits 94 and of holes 95 further slits 96 are arranged that extend along the entire width of the top face 76 and continue for a short length at the respective ends on the side faces 79 and 80. The ends of each further slit 96 have a widening 97.
The function of the further slits 96 and of the respective end widenings 97 is the same as that of the slits 83 with the respective widenings 84 disclosed previously.
Figures 44 and 45 disclose a fifteenth embodiment of a diffuser element 98 according to the invention, similar to the diffuser element 93 shown in Figures 42 and 43.
In the diffuser element 98, the further slits 96 terminate at their respective ends, on the side walls 79 and 80, with a length of L-shaped slit 99 that in turn terminates with a widening 100.
The function of this length of slit 99 and of the respective widening 100 is to further reduce the risk of concentrations of mechanical stress, which could be generated by the heat

expansion to which the diffuser element 98 is subjected during burner operation.

Figures 46 to 49 show assembly of a diffuser element 46 in a burner with a cylindrical envelope diffuser as for example shown in Figure 1.

The base element 2 and the head element 3 of the burner are respectively equipped with annular internally hollow protrusions 101, 102 with U-shaped sections, in which the ends of the diffuser elements 46 can be inserted.

The front walls, 103 and 104 respectively, of the annular protrusions 101 and 102 are provided at regular intervals with projections 105 suitable for coupling with the projections 56 made in the ends of the diffuser elements 46 to fix in position each diffuser element 46 and prevent it from being able to undergo shifts during burner operation.

The presence of projections 105 that are coupleable with the projections 56 of the diffuser element 46 makes the assembly of the burner diffuser very quick and easy.

Figures 50 and 51 show a sixteenth embodiment of a diffuser element 106 according to the invention having a substantially triangular plan shape with a top face 107 in which openings 108, 108a are made for the evacuation of the mixture of air and fuel, side walls 109 and front wall 110.

The openings 108, 108a may have the shape of rows of slits 108 alternating with rows of holes 108a.

Figure 51 shows two diffuser elements 106, brought up to form a portion of burner diffuser.

Figure 52 shows a burner 111 the diffuser of which is made with the diffuser elements 106 shown in Figures 50 and 51.

The burner 111 is provided with a cylindrical body 112, one of the bases of which forms a diffuser 113 made with the diffuser elements 106. The burner is provided with a tube 114 for conveying the mixture of air and fuel to the burner body 112.

Figure 53 shows a portion of a burner 115, the body 116 of which has a hollow cylindrical shape, the internal surface of which forms the diffuser 117 of the burner, made with

diffuser elements according to the invention, for example diffuser elements 60 according to the tenth embodiment of the diffuser elements.

Figure 54 shows a cylindrical burner 118 according to the invention, similar to the burner shown in Figure 1, wherein the diffuser 119 is made with a plurality of diffuser elements according to the invention, for example diffuser elements 46, 57, or 60 according to the eighth, ninth and tenth embodiments respectively.

Figures 55 and 56 show a first version of the diffuser element 5 shown in Figure 4. In this first version, the diffuser element 5 is provided on its front faces 14 with respective tabs 120 obtained by punching the front faces 14. The tabs 120 are used to secure and hold in position a distributing element 85 inserted in the diffuser element 5. After insertion and positioning of the distributing element 85 in the diffuser element 5, the tabs 120 are bent towards the inside of the diffuser element 5 in such a way as to interfere with the distributing element 85 in such a way as to secure it and keep it in position as shown in Figure 56.

Figures 57 and 58 show a second version of the diffuser element 5 shown in Figure 4. In this second version, the diffuser element 5 is provided with respective recesses 121 on its front faces 14.

The recesses 121 are used to secure and hold in position a distributing element 85a inserted in the diffuser element 5. The flow-distributing element 85a is similar to the flow-distributing element 85 and differs from it by the presence on the plate 86a of a plurality of traverse projections 122, that are substantially parallel to one another, the function of which is to act as spacers, to keep the flow-distributing element 85a at a distance from the top face 7 of the diffuser element 5. After inserting and positioning the distributing element 85a in the diffuser element 5, the recesses 121 of the front faces 14 secure and maintain in position the distributing element 85a, as shown in Figure 58.

Figures 59 and 60 show a system of fitting of a diffuser element 5 in a burner 20 like the one shown in Figure 5.

In this fitting system, the walls 24 of the substantially rectangular frame 21 of the burner 20, parallel to the front faces 14 of the diffuser element 5, are provided with recesses 123 positioned in such a way as to keep the diffuser element 5 in position after the latter has been placed in position in the substantially rectangular frame 21, as shown in Figure 60.

In the practical embodiment, the materials, dimensions and construction details used may be different from those indicated but be technically equivalent to them without thereby falling outside the legal scope of the present invention.